

INFORMATION PROCESSING APPARATUS, PRINT TIME
INFORMING METHOD, AND COMPUTER-READABLE
MEMORY MEDIUM STORING PROGRAM THEREIN

5 BACKGROUND OF THE INVENTION

Field of the Invention

10 The invention relates to an information processing
apparatus and an information processing method for
processing characters or an image document and
outputting, and to a computer-readable memory medium
storing therein a program for realizing such a method.
More particularly, the invention relates to an
information processing apparatus and a print time
informing method for calculating a time that is
15 required for a printing process before the start of
printing and informing the user of the print time, and
to a computer-readable memory medium storing therein a
program for realizing such a method.

Related Background Art

20 Hitherto, in a printer driver for forming print
data to be transmitted to a printing apparatus, the
user has to perform various print setups, for example,
he has to set: a print object to designate print
quality such as print resolution, print gradation, or
25 the like; a print layout to designate a both-side
print, an N-in-one page print, or a booklet print; a
paper delivery method to designate staple, saddle

stitch, or sort; a paper feeding method to designate a paper feeding unit every page; and the like. To perform the print setups by using such a printer driver, the user has to set them in consideration of an effect of each print setup, so that an advanced knowledge is necessary.

For this purpose, the recent printer driver has a plurality of print environments defining a plurality of print setups, and a name (standard print, 2-page print, confidential, bit map development, photograph image, booklet print, etc.) which can be easily understood by the user is added to each print environment and displayed to a user interface. Therefore, if the user discriminates the name of the print environment from a plurality of print environments (also called "print profiles") and selects a desired print environment, a plurality of print setups defined among the print environments (print profiles) are automatically performed and the print data can be formed on the basis of the print setup. Therefore, the user can relatively easily obtain a desired print output.

However, although the printer driver takes into consideration a purpose of allowing the user to easily understand the print environment, nothing is considered about a method of allowing the user to understand a time that is required for a printing process in accordance with each print environment. In this case,

the print time largely differs depending on the print environment and when the user arbitrarily selects the print environment, it is presumed that a print time longer than he has expected is required. Use

5 efficiency of the printer driver is not high for the user from a viewpoint of time.

There is a method whereby the printer driver forms print data, in a printer and a print server, print quality (resolution, gradation, data amount) of the
10 print data is analyzed, a time that is required for the printing process is calculated, and the user is informed of a time which is required for a print output and the time at which the print output is obtained. However, according to the method whereby, in the
15 printer and print server, the time is calculated and informed to the user, in order to obtain a print output by another method when the user is dissatisfied with the time, it is necessary to form the print data again from an application and dissatisfaction of the user
20 still remains.

The contents of the print data which is analyzed in the printer and print server are no more than the print quality regarding the data amount, print resolution, and print gradation of the print data.
25 There is not a method which takes into consideration a print time which is required for conditions (other than the print quality) such as a print layout or the like

for designating an N-in-one page print (the print data of N pages is reduced, arranged, and printed onto a recording paper of one page) or a booklet print (print pages are rearranged in booklet order and print data of four pages is reduced, arranged, and printed in accordance with a double spread direction in which they are booklet printed onto a recording paper of one page). The time which is actually required for the printing process cannot be accurately calculated.

A direct printer such that a memory card slot is formed in the printer and an image stored in a memory card can be recorded without passing through a host computer has also been proposed. A small printer represented by an ink jet printer such that a color image like a photograph can be recorded has also been put into the market. Photograph image quality can be easily obtained.

Recording media having an ink receptor layer are also being improved, and they have a feature such that an image which is sharper than that in case of recording onto a plain paper and has excellent coloring performance can be recorded and a texture of the paper is good. Owing to those recording media, a degree of freedom of the user who selects a proper medium in accordance with a required image level is being widened more and more. Therefore, a variety of recording modes for improving quality of a recording image can be set.

The number of recording modes lies within a range from a few kinds to tens of kinds. Since the time that is required for recording also changes in dependence on the recording medium and a setting state of the

5 recording mode, a print mode which takes a time longer than expected by the user also exists. It is difficult for the user to easily select a desired print mode.

The problem is not limited to the print time. In the current print system, it is difficult that the user
10 compares and examines the relations between the image qualities which are obtained from the recording media and the costs thereof, selects a proper relation from the several media, and executes the recording of high cost performance.

15 That is, there is a drawback such that it is difficult to integrally judge the print quality, the costs which are required for printing, and the recording time before instructing the print through the printer driver and select the kind of recording medium
20 (hereinafter, referred to as a media type) and the print mode, so that a working efficiency deteriorates.

SUMMARY OF THE INVENTION

The invention, therefore, is made in consideration
25 of the above conventional example and it is an object of the invention to provide a function for informing the user of a print time which is required for a

printing process by using a printer driver before the
print is started. In consideration of the above
object, another object of the invention is to enable
the user to select a desired print purpose by
5 calculating print times every plural print purposes and
inform the user of each print time. In consideration
of the above object, still another object of the
invention is to enable the user to select a desired
print environment by calculating a print time every
10 print environment and inform the user of each print
time. By previously informing the user of the print
time, the user can make a final decision about the
execution of the print.

The invention is also made in consideration of the
15 above points and it is an object of the invention to
enable a proper media type and a proper print mode to
be selected from a variety of media types and print
modes by using a user interface of a printer driver
having high operability, thereby preventing the
20 occurrence of improper setup by the user.

To accomplish the above objects, according to the
invention, there is provided an information processing
apparatus for forming print data to be printed by a
printing apparatus, comprising: obtaining means for
25 obtaining draw information based on a print document
which is formed by an application; setting means for
setting print set information at the time of executing

a printing process of the print data by the printing
apparatus; and estimating means for estimating a print
time which is required for the printing process on the
basis of the draw information obtained by the obtaining
5 means and the print set information set by the setting
means.

Other features and advantages of the present
invention will be apparent from the following
description taken in conjunction with the accompanying
10 drawings, in which like reference characters designate
the same or similar parts throughout the figures
thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Fig. 1 is a block diagram of a print system
comprising a host computer and a printer;

Fig. 2 shows software for printing in the host
computer;

20 Fig. 3 is a diagram of a memory map at the time of
printing or printer setup in the host computer;

Fig. 4 is a diagram showing a user interface for
setting whether an estimation of a print time is
performed on a window or not;

25 Fig. 5 is a flowchart for a procedure for
estimating the print time;

Fig. 6 is a flowchart for a procedure for
estimating the print time;

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section on a property window in the fifth embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(First Embodiment)

5 An embodiment of the invention will be described hereinbelow with reference to the drawings.

<Construction of print system>

Fig. 1 is a block diagram of a print system comprising a host computer 3000 and a printer 1500.

10 In Fig. 1, the host computer 3000 has a CPU 1 for executing a process of a document in which a figure, an image, characters, a table (including a spreadsheet or the like), and the like exist mixedly on the basis of a document processing program or the like stored in a
15 program ROM in an ROM 3. The CPU 1 integrally controls each device connected to a system bus 4. An RAM 2 functions as a main memory, a work area, or the like. Each module of a printer driver program of the invention is read in the RAM 2 and the CPU 1 executes a
20 process on the basis of each module.

A keyboard controller (KBC) 5 controls a key input from a keyboard 9 or a pointing device (not shown). A CRT controller (CRTC) 6 controls a display on a CRT display 10. A printer setup window, which will be
25 explained hereinlater, is also displayed on the CRT 10.

A disk controller (DKC) 7 controls an access to an external memory 11 such as hard disk (HD), floppy disk

(FD), or the like for storing a boot program, various applications, font data, a user file, an edition file, and the like. Each module of a printer driver program of the invention has been stored in the external memory 11 or ROM 3 and is read out and stored into the RAM 2 as necessary.

A printer controller (PRTC) 8 is connected to a printer 1000 through a predetermined bidirectional interface (I/F) or a network 21 and executes a communication control process with the printer 1500. The CPU 1 executes, for example, a developing (rasterizing) process of an outline font into a display information RAM set on the RAM 2, thereby enables WYSIWYG (function for making display contents coincide with print contents) on the CRT 10. The CPU 1 executes a program for realizing a procedure of a flowchart, which will be explained hereinlater, opens various registered windows on the basis of a command instructed by a mouse, a cursor, or the like (not shown) on the CRT 10, and executes various data processes.

In the printer 1500, a printer CPU 12 integrally controls accesses to various devices connected to a system bus 15 on the basis of a control program or the like stored in a program ROM in the ROM 13 and outputs an image signal as output information to a printer engine 17 connected through an engine I/F 16. The printer engine 17 has a staple stacker for executing

the stapling operation.

The CPU 12 can communicate with the host computer through the network 21 and notify the host computer 3000 of information or the like in the printer.

5 Reference numeral 19 denotes an RAM which functions as a main memory, a work area, or the like of the CPU 12. An input unit 18 can control the communication with the host computer 3000 with respect to status information or the like such as print status information or the
10 like through the network and inform the host computer 3000 of the information or the like in the printer. The input unit 18 is called a network board.

A memory controller (MC) 20 controls an access to an external memory 14 such as hard disk (HD), floppy
15 disk (FD), or the like for storing a boot program, various applications, font data, a user file, an edition file, and the like. An operation unit 1501 includes a display panel and a keyboard, provides information to the operator, and allows an instruction
20 to be inputted from the operator.

<Function of printer>

Fig. 10 is a cross sectional view of the printer 1500 showing an outline of a mechanism of the printer engine 17.

25 A laser driver 221 drives a laser emitting unit 211 so as to emit a laser beam according to the image data which is formed on the basis of the print data

received from the host computer 3000. The laser beam is irradiated onto a photosensitive drum 212, so that a latent image according to the laser beam is formed on the photosensitive drum 212. A developing agent is
5 adhered to the portion of the latent image on the photosensitive drum 212 by a developing device 213. A recording paper is fed out of a cassette 214 or a cassette 205 at timing synchronized with the start of irradiation of the laser beam and conveyed to a
10 transfer unit 206, and the developing agent adhered onto the photosensitive drum 212 is transferred onto the recording paper. The recording paper on which the developing agent has been adhered is conveyed to a fixing unit 207. The developing agent is fixed onto
15 the recording paper with heat and a pressure of the fixing unit 207. The recording paper which passed through the fixing unit 207 is delivered by delivery rollers 208.

If a both-side recording mode has been set, after
20 the recording paper is conveyed to the delivery rollers 208, the rotating direction of the delivery rollers 208 is reversed, thereby guiding the paper onto a paper refeed conveying path by a flapper 209. If a multiplex recording mode has been set, the recording paper is
25 guided to the refeed conveying path by the flapper 209 lest the recording paper is conveyed to the delivery rollers 208. The recording paper guided to the refeed

conveying path is supplied to the transfer unit 206 at the timing mentioned above.

The recording paper delivered by the delivery rollers 208 is inserted into a delivery device 171.

5 The delivery device 171 is controlled by a delivering method which is designated by the print data from the host computer 3000. If there are a plurality of copies of the print data and a sorting mode has been designated, the papers are sequentially delivered one
10 page by one in order from an upper bin onto a sorter 217 of a vertical driving type.

<Software construction of host computer>

In such a system, the software for allowing the host computer 3000 to print is constructed as shown in
15 Fig. 2. That is, in case of printing a print document such as a text or the like formed by an application 201, the application forms a draw command by using an interface function specified by the OS (Operating System) on the basis of the print document. The formed
20 draw command is supplied to a graphic engine 202 as a part of the OS by a printing request from the application. For example, in case of the Windows OS (registered trademark of Microsoft Corporation in U.S.A.), the graphic engine 202 is called GDI. The
25 graphic engine 202 obtains a draw command (first draw function) using an interface function (GDI function: Graphical Device Interface) specified by the GDI from

the application 201, converts it into a draw command
(second draw function) which can be interpreted by a
printer driver 203 that is peculiar to the printer
1500, and sends it to the printer driver 203. The
5 printer driver 203 forms print data suitable for the
printer 1500 on the basis of the draw command (DDI
(Device Driver Interface) function) received from the
graphic engine 202.

The printer driver 203 sends the formed print data
10 to a system spooler 204. The system spooler spools the
print data and transmits the print data to the printer
in accordance with a schedule of the printer.

Fig. 3 shows an example of a memory map in the RAM
2 upon printing in the host computer 1500 or upon
15 setting of the printer. An application 32 executes the
print by using an OS 36 and a print program (printer
driver) 35. A BIOS 37 is called a basic input/output
system and includes therein a program for driving a
parallel interface, a serial interface, or the like
20 which is connected to the printer 1500.

The print control program (printer driver) is
constructed by a plurality of modules. The following
modules are included among the plurality of modules.

First, there is an obtaining module for obtaining
25 draw information based on a print document which is
formed by the application. The obtaining module
obtains the draw information including an ID of each

object constructing the print document prior to
executing the print through the application and an
expansion API. The obtaining module also obtains the
second draw command (DDI function) which is issued by
5 the OS on the basis of the first draw command (GDI
function) issued by the application.

There is also a user interface providing module
for providing a user interface for setting the print
set information at the time when the printing process
10 of the print data is executed in the printing
apparatus. The user interface providing module
provides a user interface shown in Fig. 4. This user
interface is displayed on a display unit through the
OS. The user interface shown in Fig. 4 is constructed
15 by a plurality of sheets and various print setups can
be performed every sheet. As print set information,
there are information regarding the print quality in
the print data (this information is set by a sheet of
the print quality) and information regarding the print
20 layout (which is set by "page layout" on a page set
sheet). Further, the user interface providing module
provides a user interface for setting a print profile
(S403 in Fig. 4) obtained by collecting a plurality of
print set information at the time when the printing
25 process of the print data is executed in the printing
apparatus.

There is also an estimating module for estimating

a print time which is required for the printing process on the basis of the draw information obtained by the obtaining module and the print setup set by the user interface. The details of the estimating module will
5 be explained with reference to a flowchart, which will be mentioned hereinlater. The estimating module estimates a print time which is required for the printing process every plural print profiles which are set through the user interfaces (S401 and S402 in Fig.
10 4) which are provided by the user interface providing module.

There is also an informing module for informing the user of the print time estimated by the estimating module before the print data is formed. The informing
15 module provides the print time and a user interface (Fig. 9) for promoting the input of an instruction for executing the printing process which needs the print time. This user interface is displayed on the display unit through the OS. As shown in Fig. 9, the user
20 interface informed by the informing module can accept the input of an instruction for canceling the execution of the printing process which needs the print time.

There is also a forming module for forming the print data based on the print document after the print
25 time was informed by the informing module.

The modules further include a transmitting module for transmitting the print data to the printing

apparatus through the network.

Related data 34 also includes set information which is set and used by the printer driver and a structure called DEVMODE in addition to the setups for printing such as paper size, layout information, and the like.

A procedure for estimating and informing the print time every print environment called "favorites" including other conditions such as print quality, print layout, and the like will now be described with reference to Figs. 4, 8 and 9 and flowcharts of Figs. 5 to 7.

<Print time informing method and procedure for displaying print time every favorite>

The user sets a plurality of print set information as a print environment (favorite: S403 in Fig. 4) such as print layout, paper size, print quality, paper delivery method, and the like as a print processing method in accordance with the printer which is used by using the user interface that is provided by the user interface providing module of the printer driver shown in Fig. 4. As an example of the method of setting the print set information, there is a method whereby when the user calls the printer setup which is provided from the operating system (OS) or the like, the printer driver is called from the OS. The user interface providing module of the printer driver provides the

user interface for setting the set information that is peculiar to the printer to the OS. The OS allows the user interface window to be displayed on the display unit through the display driver. The user performs the
5 setup on this window.

In the embodiment, it is assumed that the setup is performed by such a method.

Fig. 4 shows an example of a window for performing the printer setup in the case where the printer setup
10 is called by the user. In the example, there are a plurality of sheets for performing the setup such as "general", "detail", "page setup", "finishing", "paper feed", "print quality", "configuration", and the like. The user selects a desired user interface by switching
15 the setup sheets in accordance with the information to be set. Fig. 4 shows an example in the case where the "page setup" window is selected from those setups. On this window, the user sets each item by using the pointing device such as a mouse or the like or the
20 keyboard and executes the setup (S401 in Fig. 4) for estimating the print time.

Fig. 5 is a flowchart regarding a procedure in the case where the print time estimating setup is executed on the window of Fig. 4 and the print is executed.

25 First, in step S501, whether an "estimate print time" check box S401 in Fig. 4 is ON or not is discriminated. If it is OFF, the normal print is

executed and the processing routine is finished.

If the "estimate print time" check box is ON, the obtaining module of the printer driver is informed of an ID every draw object defined in the printer driver
5 from the application (step S502).

It is notified by using means such that the application uses an API function (expansion API) which is exported by the printer driver and the obtaining module is informed of the object ID. Therefore, the
10 application 201 and printer driver 203 can transmit and receive data without using the graphic engine 202.

Subsequently, in step S503, the estimating module in the printer driver estimates the print time on the basis of the draw object ID received by the obtaining
15 module from the application in step S502. Details in step S503 will be described hereinlater with reference to the flowchart of Fig. 6.

When the estimation of the print time is finished with respect to all of the favorites in step S503, the
20 CPU 1 displays the print time onto the CRT 10 as a display unit every print environment on the basis of the informing module in the printer driver (step S504). Fig. 9 shows such an example and relates to a display example in the case where the favorite (print
25 environment) of "standard setup" is selected and the print is executed.

The user can instruct "execute" and "cancel" of

the print before the print is executed with reference to the print time shown by the user interface shown in Fig. 9. Since the print time in the case where the print is executed in each favorite is displayed, it becomes reference data in case of printing next time.

If it is determined that a "cancel" button in Fig. 9 is pressed (YES in step S505), on the basis of a deleting module in the printer driver, the CPU 1 deletes the draw information which was received from the application and held and finishes the processing routine without executing the printing process. On the contrary, if it is decided that a "continue" button is pressed by the user (NO in S505), the CPU 1 executes a forming process of the print data by the printer driver 203 on the basis of the draw command obtained from the graphic engine 202 in step S506 and finishes the processing routine.

Fig. 6 is the flowchart for explaining the processes of the CPU 1 based on the printer driver for calculating the number of print profiles to estimate the print time at the time of estimating the print time (step S503 in Fig. 5).

First, in step S601, the CPU 1 discriminates whether an "estimate for every favorite" check box S402 in Fig. 4 is ON or not. If it is determined that the check box S402 is ON, in step S602, the CPU 1 searches the number of print profiles ("favorites") as print

environments stored in a registry on the basis of an instruction from the printer driver and sets it into a variable "Num". In step S603, the CPU 1 sets "0" into a variable "i" and executes the print time estimating process (S605) every print profile until the variable "i" is equal to "Num".

Fig. 7 is the flowchart for explaining the process of the CPU 1 based on an estimating module for estimating the print time (step S605).

10 In step S701, the CPU 1 initializes "Sum" as a sum variable value of the print times to "0" on the basis of an instruction of the estimating module. Subsequently, in step S702, the CPU 1 discriminates the presence or absence of the draw object ID informed from the application in step S502. If it does not exist, since this means that the print times of all of the draw objects have been calculated, the time that is required for the printing process is estimated on the basis of the "Sum" value indicative of the numerical value of the sum time and the print time estimating process is finished. The print time which is estimated on the basis of the "Sum" value is a total value of the following three times: that is, a print data forming time which is required to form the print data in the printer driver; a rasterizing time which is required to rasterize and form the image data on the basis of the print data in the printing apparatus; and a delivery

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time which is required until the image is formed on the basis of the image data and the paper is delivered to a delivery unit after the recording paper was fed.

Although the rasterizing time and the delivery time are

5 different in dependence on the kind of printing apparatus, since those values have previously been held in the printer driver (since the printer driver is prepared in correspondence to the printing apparatus),

they can be easily obtained. Although not shown, a

10 time conversion table for obtaining the print time (print data forming time + rasterizing time + recording time) from the "Sum" value as a time numerical value has also previously been held in the RAM 2 or external memory 11 as memory means in a manner similar to a
15 print time table in Fig. 8.

If the object ID exists in step S702, the CPU 1 searches the print time every target shown by the draw object ID on the basis of the print time table in Fig. 8 and sets it into a variable (a) in step S703.

20 The print time table is as shown in Fig. 8. The numerical value of the time which is required for printing is obtained on the basis of the draw object ID informed from the application in step S502 and the "favorite name" in the print profile obtained from the
25 registry and set into the variable (a). In step S704, the CPU 1 adds the print time (a) which is required every draw object to the sum value "Sum" of the print

times on the basis of an instruction of the estimating module.

On the basis of the estimating module, the CPU 1 repeats the above process until the print object ID informed from the application does not exist, thereby calculating "Sum".

The estimating process of the print time of every favorite in step S605 is repeated until the variable "i" reaches the number "Num" of registered favorites as mentioned above. Even if the "estimate for every favorite" check box S402 in Fig. 4 is OFF in step S601, the foregoing print time estimating process is executed by using the favorite name set in a "favorite" check box S403 in Fig. 4 (step S607).

According to the information processing apparatus of the invention, the estimating means (process of the CPU 1 based on the estimating module in the printer driver) estimates the print time from the application obtained by the obtaining means (process of the CPU 1 based on the obtaining module in the printer driver) through the expansion API on the basis of the ID of the draw object constructing the print document. However, such a process can be also realized by using the following method instead of having the expansion API.

First, a printing request from the application is generated and the printer driver obtains the draw command (DDI function) through the OS. A spool module

in the printer driver converts the DDI function as a draw command into data of an intermediate format (hereinafter, it is referred to as intermediate data) and spools the converted intermediate data as an intermediate file into spool means (work area in the RAM 2). In parallel with the spooling process of the spool module, the obtaining module obtains DEVMODE (structure in which the print set information has been described) showing the print profile obtained by collecting a plurality of print setups set by the user interface in the printer driver through the OS and allows the spool means to hold the DEVMODE in association with the intermediate data of the print document.

15 An analyzing module in the printer driver reads the intermediate data from the intermediate file and analyzes its contents, thereby recognizing an object attribute (draw object ID) of each intermediate data. On the basis of the object attributes of all of the intermediate data of the print document and the print time table (Fig. 8), the estimating module of the printer driver calculates the time numerical value and converts the time numerical value by using the foregoing time conversion table, thereby estimating the print time. According to the estimating process by the estimating module, a plurality of print profiles held in the spool means are read and the time numerical

value is estimated every plural print profiles on the basis of the print set information set by each print profile.

5 The estimation of the time numerical value which is executed in consideration of the print profile will be simply explained. In the print layout in the print profile, explanation will be first made with respect to a case of executing a "2-page print (in the case where two logic pages (pages which are issued from the application)" are reduced and printed onto one sheet of recording paper) as a page layout. In case of performing the 2-page print, an arranging process for reducing each logic page and subsequently rearranging the reduced pages to a physical page is necessary.

10 Although the print data forming time that is longer than the ordinary time, for example, by the time which is required for the reducing process (0.1 second is required for one physical page) and the time which is required for the arranging process (0.05 second for one physical page) is required, the rasterizing time becomes short because the number of physical pages is reduced to the half. If the staple mode is designated as a delivery method, a delivery time becomes longer, for example, by the time that is required for the stapling process (0.5 second per copy).

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After the user is informed of the print time as a user interface shown in Fig. 9, if the user instructs

the cancellation of the print on the user interface,
the deleting module in the printer driver deletes the
intermediate data of the relevant print document
spooled in the spool means. On the other hand, if the
5 user instructs the execution of the print on the user
interface shown in Fig. 9, a despool module in the
printer driver forms again the GDI function as a first
draw command based on the print profile on the basis of
the relevant intermediate data spooled in the spool
10 means and outputs it to the graphic engine 202. When
the DDI function as a second draw command formed again
by the graphic engine 202 is received, a print data
forming module in the printer driver forms print data
(page description language) to be printed by the
15 printing apparatus on the basis of the DDI function.
The print data is transmitted to the printing apparatus
by a transmitting module through the network (LAN 21).
(Second Embodiment)

In the second embodiment, in the printer 1500
20 described in the first embodiment, a system which can
execute the printing process by using a plurality of
kinds of recording media will now be described. The
same component elements as those in the foregoing
drawings are designated by the same reference numerals
25 and will be explained.

The printer 1500 is connected to the host computer
3000 as an information processing apparatus of the

invention through the interface 21. The printer 1500 receives a print control code and print data including draw data from the printer driver 203 and, contrarily, returns the information on the printer 1500 side to the
5 host computer 3000 having the printer driver 203. In the embodiment, a serial type ink jet printer for printing by emitting a liquid ink is presumed as a printer 1500. Therefore, the printer 1500 can record to various media in accordance with a use application
10 and a purpose in a range from a medium for a high quality image having an ink receptor layer for photograph gradation recording to a plain paper. To suppress lateral stripes on the image, devices in various recording modes such that the recording of one
15 line is executed by scans of a plurality of number of times, and the like are provided for the printer.

A procedure at the time of executing the printing process in the print system including the host computer 3000 and printer 1500 mentioned above will now be
20 described with reference to a flowchart of Fig. 11. First, in step S1101, the user instructs the print through the user interface displayed on the CRT display 10, so that the printer driver 203 inputs a print command as a DDI function through the graphic engine
25 202. In S1102, the printer driver 203 forms a print window and allows it to be displayed by using the CRTC 6. Fig. 12 shows an example of the print window. On

this print window, the user can designate the print pages in a "pages to print" check box 1201 and the number of copies in a "copies" check box 1202, respectively.

5 In S1103, the printer driver 203 discriminates whether the designation of the print pages and the number of copies by the user has been finished or not. If it is determined that the print pages and the number of copies were designated by the user, the printer
10 driver 203 opens a printer property window shown in Fig. 13 in S1104. The printer driver 203 can also open the printer property window in an interlocking relational manner with the depression of a "property" button 1203 at the upper right position on the print
15 window shown in Fig. 12 by the user. When the printer property window is opened, the printer driver 203 first displays a paper tab section in a state where a paper tab 1301 has been pressed in S1105. Fig. 13 shows an example of the paper tab section on the property
20 window. On the paper tab section, the user can select a desired paper size from a pull-down menu appearing when a pull-down key 1302 is pressed. In the diagram, a state where the A4 size has been selected is shown. Further, either a check box 1303 or 1304 is set to ON,
25 thereby instructing whether the size is changed or not. If a size change print is selected, a rate is set. A print orientation is instructed by setting either a

check box 1305 or 1306 to ON.

In S1106, the printer driver 203 discriminates whether the paper setup by the user has been finished or not. If the printer driver 203 determines that the paper setup by the user has been finished, the printer driver 203 displays a main section in S1107. By pressing a main tab 1307 by the user, the processing routine can also advance to a process for opening the main section on the property window.

Fig. 14 shows an example of the main section on the property window. In the main section, three preferential items such as "quality-preferential" 1401, "time-preferential" 1402, and "CP-preferential" 1403 are set. A list of a paper, a recording mode, and an estimated recording time corresponding to each item is displayed. Further, when one of "image" buttons 1404 to 1406 corresponding to the respective items is depressed, a recording image window of a real size is opened. Thus, the user can confirm a pseudo recording result and perform a selection that is nearer to his hope. If the user wants to record onto a special medium such as an OHP paper or the like, the mode is set to a mode suitable for the medium by setting the other paper to ON.

As for the paper and the recording mode, a ratio of color ink in the recording image is calculated by the printer driver 203 of the host computer 3000, a

list for photograph image quality, a list for graphic
image quality, and a list for text image quality are
automatically set in correspondence to the calculated
ratio. A list of combinations determined for each
5 image quality is displayed in the main section.

Therefore, the contents of the list in the main section
are changed in dependence on the recording image. By
displaying a combination every preferential items, the
selecting work is made easy and the system having
10 excellent operability is realized.

A discriminating method of the recording image
will now be described with reference to Figs. 15 and
16. Fig. 15 is a block diagram showing a functional
construction of the host computer 3000. In the
15 diagram, the application 201 sends an application
command as a GDI function to the graphic engine 202 and
requests the output of characters, figures, and the
like to the printer 1500.

In the graphic engine 202, under a control of the
20 graphic controller 1501, the application command (GDI
function) received from the application 201 is analyzed
by a command analyzer 1502. Further, it is converted
into a data format depending on the image data or
device as necessary by a figure drawer 1503 and sent to
25 the printer driver 203. After it is converted into the
image data by the figure drawer 1503, a ratio of color
data which occupies in the recording data is calculated

by a color duty calculator 1504. The calculated duty value is sent to the printer driver 203 together with the image data. The print data is sent to the printer 1500 together with the control command from the printer driver 203, and the printing process is executed.

Although the color duty calculator 1504 has been described as a module of the graphic engine 202, the calculator 1504 is not necessarily limited to it but can also function as a partial module of the printer driver 203.

Fig. 16 is a flowchart regarding the discrimination of the recording image. In S1601, the application 201 sends the application command to the graphic engine 202. In S1602, an analysis of the application command and a figure drawing are executed by the graphic engine 202. In S1603, a color duty value is calculated. In S1604, the draw data and the color duty value are sent to the printer driver 203.

In S1605, the printer driver 203 discriminates whether the color duty value is equal to or larger than 30% or not. If it is determined that the color duty value is equal to or larger than 30%, the printer driver 203 sets the print setup into the list for photograph image quality in S1606. If it is determined that the color duty value is less than 30%, the printer driver 203 further discriminates whether the color duty value is equal to or larger than 10% or not in S1607.

If it is determined in S1607 that the color duty value is equal to or larger than 10%, the printer driver 203 sets the print setup into the list for graphic image quality in S1608. If it is determined that the color
5 duty value is less than 10%, the printer driver 203 sets the print setup into the list for text image quality in S1609. In Fig. 14, a list in the case where the print setup has been set into the list for photograph image quality is displayed.

10 As described above, the recording image is discriminated from the color duty value of the image and the list according to the discrimination contents is displayed. In the embodiment, although the discrimination about the recording image has been made
15 in accordance with the ratio of the color data, another method whereby a ratio of text data is obtained or the like can be also used. In this case, for example, if the text print ratio is equal to or larger than a predetermined value, it is determined that such an
20 image is an image constructed mainly by a text, it is sufficient to set the print mode to a normal recording mode (list for text image quality). If it is less than the predetermined value, it is sufficient to set the mode to a photograph recording mode (list for
25 photograph image quality).

Explanation will now be returned to the flowchart of Fig. 11. The user integrally determines the proper

mode from the obtaining situation of the paper, the recording time, and the image quality, sets one of check boxes 1407 to 1409 corresponding to the items 1401 to 1403 in the main section in Fig. 14 to ON, and
5 selects it.

If it is determined that the selection of the preferential items has been finished in S1108, the printer property window is closed in S1109. When a print "OK" button 1204 on the print window in Fig. 12
10 is pressed in S1110, the printer driver 203 executes the forming process of the print data in S1111.

The displaying method of the main section in the property window is not limited to the foregoing example but a method whereby an order is added to each
15 combination of the recommended paper and recording mode and they are expressed or a method whereby a few candidates are merely displayed and the user is allowed to select a proper one and express it can be also used. It is not always necessary to display all of the paper
20 type, recording mode, recording time, and image quality confirmation. It is also possible to merely display some of them. Further, as shown in Fig. 17, it is also possible to display by adding a recommended mark 1701 to the recommended items (combination of the paper,
25 recording mode, recording time, and image quality).

(Third Embodiment)

The combination according to the preferential

items has been displayed as a list in the second embodiment. In the third embodiment, means which can previously instruct the preferential item is provided and a confirmation window is shown without displaying a plurality of candidates to be selected.

Fig. 18 shows an example of a print window according to the third embodiment. On a pull-down menu 1801 for decision of preferential items, one of "quality" preference, "balance" preference (balance regarding all or a part of the image quality, time, and costs), and recording "time" preference is selected and preset. In this selection, once it is set, the same set contents are maintained until it is changed next. When the "property" button 1203 is pressed after the print pages and the number of copies are inputted, a paper tab section in the property window appears as shown in Fig. 19. In this example, the paper, recording mode, recording time, and the like corresponding to the preferential item instructed on the print window are displayed. After confirming them, the user presses an "OK" button 1901, further presses the "OK" button 1204 on the print window, and executes the print.

In the embodiment, once the preferential item is determined, the paper and the recording mode are automatically determined from the image contents. Therefore, the user can execute the recording according

5 (Fourth Embodiment)

20 (Fifth Embodiment)

A mark for discriminating the media type is previously printed to an area out of a recording range of the recording medium and a reflecting type optical sensor for reading such a mark is provided in a paper tray of the printer 1500, thereby enabling the type of recording medium to be automatically detected. In the fifth embodiment, in addition to the display contents

described in all of the foregoing embodiments, the detection information is displayed. Thus, an erroneous selection of the recording medium can be prevented.

Fig. 20 shows a main section on the property window in the fifth embodiment. The mounted papers which were automatically detected as mentioned above are displayed in a mounted paper display area 2001. That is, the detection information of the reflecting type optical sensor (not shown) is sent from the printer 1500 to the printer driver 203 in the host computer 3000 through the interface 21. The driver 203 displays the name of the mounted papers corresponding to the mark for discrimination of the medium type into the area 2001. In the diagram, an IJ plain paper is displayed.

In the embodiment, the papers actually mounted are compared with the papers corresponding to each preferential item and a process such as replacement of the papers or the like is executed and, thereafter, the recording can be performed. Therefore, a deterioration of the image quality or a delay of a recording speed due to an erroneous operation can be prevented. It is also possible to automatically select the preferential items to which the papers matched with the actually mounted papers belong or to add the recommended mark 1701 as described in Fig. 17.

(Other embodiments)

The invention also incorporates a case where in order to make the various devices operative so as to realize the functions of the embodiments mentioned above, program codes of software to realize the functions of the embodiments mentioned above are supplied to a computer in an apparatus or a system connected to the various devices and the various devices are made operative in accordance with a program stored in the computer (CPU or MPU) of the system or apparatus.

In this case, the program codes themselves of the software realize the functions of the embodiments mentioned above. The program codes themselves and means for supplying the program codes to the computer, for example, a recording medium in which the program codes have been stored construct the present invention. As a recording medium for storing the program codes, for example, it is possible to use a floppy disk, a hard disk, an optical disk, a magnetooptic disk, a CD-ROM, a CD-R, a CD-RW, a DVD-ROM, a DVD-RAM, a magnetic tape, a nonvolatile memory card, an ROM, or the like.

Naturally, the program codes are incorporated in the embodiments of the present invention not only in the case where a computer executes the supplied program codes, so that the functions of the embodiments mentioned above are realized, but also in the case where the program codes function in cooperation with

the OS (Operating System), other application software, or the like which is operating in the computer, so that the functions of the embodiments mentioned above are realized.

5 Further, the invention incorporates a case where the supplied program codes are stored into a memory equipped for a function expansion board of a computer or a function expansion unit connected to a computer and, thereafter, a CPU or the like equipped for the
10 function expansion board or function expansion unit executes a part or all of the actual processes on the basis of instructions of the program codes, and the functions of the embodiments mentioned above are realized by those processes.

15 The program codes themselves which are installed into a computer in order to realize the functions and processes of the invention by the computer realize the invention. That is, a computer program itself to realize the functions and processes of the invention is
20 also incorporated in Claims of the invention.

 As a supplying method of the computer program, the invention is not limited to a case where the computer program is stored into the FD or CD-ROM and it is read out by the computer and stored therein as mentioned
25 above, but it can be also supplied by a method whereby the computer is connected to a homepage of the Internet by using a browser of a client computer and the

computer program itself of the invention is downloaded from the homepage or a compressed file including an automatic installing function is downloaded. The functions and processes of the invention can be also realized by a method whereby the program codes constructing the program of the invention are divided into a plurality of files and each file is downloaded from a different homepage. That is, a WWW server for downloading the program file for realizing the functions and processes of the invention by the computer to a plurality of users is also incorporated in Claims of the invention.

The functions and processes of the invention can be also realized by a method whereby the program of the invention is encrypted and stored into a memory medium such as an FD or the like and distributed to the user, key information for decrypting the encryption is downloaded from the homepage through the Internet to the user who satisfied predetermined conditions, and the encrypted program is executed by using the key information and installed to the computer.

The shape and structure of each portion shown in the embodiments are no more than examples upon embodying the invention. The technical scope of the invention should not be limitatively interpreted by them. That is, the invention can be embodied by various forms without departing from the spirit or main

feature of the invention.

As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

As described above, according to the embodiments, by informing the user of the print time, the print in the setup in which it takes time for outputting can be preliminarily canceled.

By displaying the print time of every favorite or print purpose, it becomes the reference data in case of printing next and the print in the optimum setup can be performed.

As described above, according to the invention, since the printer driver provides the function for informing the user of the print time that is required for the printing process before starting the printing, the user can previously recognize the time which is required for the printing process.

By estimating the print time every plural print purposes and informing the user of each print time, the user can recognize the time that is required for the printing process every print purpose.

By estimating the print time every plural print environments and informing the user of each print time,

the user can recognize the time that is required for the printing process every print environment.

After the print time is informed every print purpose or print environment, an instruction about whether the printing process is executed or not is accepted. Therefore, the user can determine whether the printing process is executed or not in consideration of the print time.

After the print time is informed every print purpose or print environment, an instruction to cancel the printing process is canceled is accepted. Therefore, the user can previously cancel the print in consideration of the print time.

After the print time is informed every plural print purposes or print environments, an instruction about in which print environment the printing process is executed is accepted. Therefore, the user can instruct that the printing process is executed under a desired print purpose or print environment in consideration of the print time of every plural print purposes or print environments.